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John R. Procter

Information for Emigrants. The climate, soils, timbers, &c. of Kentucky, Contrasted with those of the Northwest.

Kentucky Geological Survey and Bureau of Immigration.

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AND BUREAU OF IMMIGRATION.

JOHN R. PROCTER, Director.

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THE CLIMATE, SOILS, TIMBERS, &c., OF

KENTUCKY,

CONTRASTED WITH THOSE OF THE

NORTHWEST.

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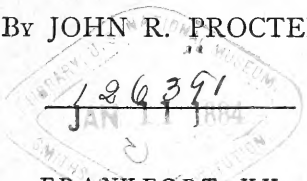

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1881.

KENTUCKY GEOLOGICAL SURVEY AND BUREAU OF IMMIGRATION.

JOHN R. PROCTER, DIRECTOR, FRANKFORT, KENTUCKY.

KENTUCKY.

Area, 40,000 square miles.

Population, 1,648,599. (Native, 1,589,131; foreign born, 59,468; colored, 271,522.)

Temperature, average annual mean, 55° Fahrenheit.

Rain-fall, from 48 to 55 inches per annum.

Kentucky is situated between latitude 36° 30′ and 39° 6′ north, and longitude 5° 00′ and 12° 38′ west from Washington. The surface of the State is an **elevated plateau,** sloping from the Cumberland Mountains on the southeast to the Mississippi and Ohio rivers on the north and west. The **Eastern Coal-field,** area over 10,000 square miles; elevation above sea level 650 feet on Ohio river to 1,300 feet on southwestern border, and 3,500 feet on the southeastern border. The great central or **Blue-grass** region (II, Lower Silurian, on the accompanying map) has an area of about 10,000 square miles; elevation of from 800 to 1,150 feet above sea. The **Upper Silurian** and **Devonian** (III, IV, on map) have an area of about 2,500 square miles; elevation of from 450 on the northwest end to 1,100 feet where they curve around the Lower Silurian on the southwest. The **Subcarboniferous** (V, VI, on map) has an area of 10,000 square miles; elevation from 350 to 600 feet on the southwest to 950 feet in the central region. The **Western Coal-field** has an area of about 4,000 square miles; elevation of 400 feet along the Ohio river to 850 feet in the southeastern portion. The **Quaternary** (VIII, on map) has an area of about 2,500 square miles; elevation of 280 feet along the river bottoms, and 350 to 450 on the uplands. The average elevation of the State is over 1,000 feet above the sea. The numerous rivers penetrating all parts of the State have worn their channels deep enough to secure ample drainage to the lands, with very few exceptions. The State has a river boundary of 813 miles: by the Chattaroi or Big Sandy on the northeast, 120 miles; by the Ohio on the north, 643 miles; and by the Mississippi on the west, 50 miles. The principal rivers have their sources in the Cumberland Mountains, and afford to all parts of the State river communication with the Ohio and entire Mississippi river system. No State has a frontage on navigable rivers equal to Kentucky. This insures to the State cheap transportation in the future for the abundant forests and large deposits of coal and iron ores contiguous to the streams.

In healthfulness the State ranks high. By the United States census of 1870 there were twenty-seven States shown to have a greater death rate than Kentucky. The deaths to total population were, in 1850, 1.53 per cent.; in 1860, 1.42 per cent.; and in 1870, 1.09 per cent., showing a steady improvement. The high elevation, perfect drainage, salubrity of climate, and purity of waters combine favorably, and insure health and vigor to the population.

That the conditions are most favorable for the production of a vigorous race of men is attested by the tables of measurements of the United States volunteers during the civil war, by A. B Gould. The soldiers born in Kentucky and Tennessee exceeded all others in height, weight, circumference around the head, circumference of chest, ratio of weight to stature, and proportional number of tall men in each 100,000 of same

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nativity. The speed and endurance of the Kentucky horse, and the superior development of all kinds of domestic animals of the State, are well known.

Climate.—A publication will be issued from this office in which records taken from the U. S. Signal Service reports show that the maximum temperature in summer is less than in States of the Northwest, whilst the minimum in winter is much higher. The lowest recorded at the U. S. Signal Service Stations in Kentucky during the cold months of December and January just passed was —8° at Louisville, whilst the minimum reported from the Signal Offices for same months was, in Dakota, —55°; in Iowa, —40°; in Kansas, —22°; in Minnesota, —44°; in Montana —59°, and in Nebraska —32°. Live stock of all kinds run through the winter upon pasture, and there is seldom a day, winter or summer, when a man may not perform a full day's work in the open air. More than one half of this State is yet covered with virgin forests, the State being only exceeded, in area of wood lands, by three States, yet it ranks eighth in the value of **Agricultural Products.**

No State or country is susceptible of greater **Variety of Products,** as is well shown by the following table, compiled from the United States Census reports. It will be seen that in each decade it excelled all other States in the production of some one or more staple articles:

	1840.	1850.	1860.	1870.
Wheat	First.	Ninth.	Ninth.	Eighth.
Swine	Second.	Second.	Fourth.	Fifth.
Mules	....	Second	Second.	Third.
Indian corn	Second.	First.	Fifth.	Sixth.
Tobacco	Second.	Second.	Second.	First.
Flax	Third.	First.	Third.	Eighth.
Rye	Fourth.	Eighth.	Fifth.	Fifth.
Hemp	First.	First	First.	First.
Wool	....	Sev'th.	Ninth.	Twelfth.
Value of live stock	....	Fifth.	Fourth.	Eighth.
Value of domestic manufactures.	Third.	....	Second.	Third.

The relative decline from the first State in the production of wheat, and the second in the production of Indian corn, in 1840, to the eighth and sixth in 1870, was not caused by the lessened production in Kentucky, but to the growth of States in the Northwest, where those are the principal crops grown. In Kentucky a more diversified agriculture and greater variety of production is found more remunerative.

In this brief communication a slight notice of the **Mineral Resources** only is possible. Kentucky is the only State having within its borders parts of the two great coal-fields. The **Area of Coal** is over 12,700 square miles, exceeding the area of the Pennsylvania coal-fields, or the entire coal area of Great Britain and Ireland.

In addition to the numerous beds of bituminous coals of excellent quality in the **Eastern Coal-field** there is the largest area of **Cannel Coal** in America. This cannel coal is very thick, and of superior quality. The present Geological Survey of the State has demonstrated the existence of excellent coking coals in the eastern coal-field, near to extensive beds of **Iron Ore.**

In the **Western Coal-field** are twelve beds of coal of workable thickness of good quality. Associated with the lower coals are several beds of limonite and carbonate **Iron Ores,** all above drainage, and situated favorably for cheap mining. One ore of good quality has an extensive area, and is from three to five feet in thickness. **Fire and Pottery Clays** are abundant in many parts of the State.

There was but slight development of **Coal Mining** in Kentucky prior to the war. The total amount mined in the State in 1870 was but 150,580 tons, which increased to 500,000 tons in 1875 and to 1,050,095 in 1880. The extension of railways now in process of construction, and the improvement of the navigation of the rivers of the State recently begun by the General Government, together with the large increase of manufacturing in this State, will insure a large increase in coal mining in the near future. There will also be a large increase in the amount of iron ore mined, and in the manufacture of iron.

Timbers.—About 50 per cent. of the area of Kentucky is in primitive forests, abounding in a great variety of valuable timbers. A mere list of the various trees to be had in abundance would occupy more space than can here be given. The following timbers are in great abundance in various parts of the State, and owing to the scarcity of trees in the great Northwest, and the early exhaustion of the supply in the Northern Lake region, the value of the timbers of this State will soon be greatly enhanced:

Oak, *Quercus alba, Q. macrocarpa, Q. rubra, Q. palustris, Q. falcata,* &c.; Maple, *Acer saccharinum;* Ash, *Fraxinus americana, F. quadrangulata;* Yellow Poplar, *Liriodendron tulipifera;* Black Walnut, *fuglans nigra;* Hickory, *Carya alba, C. glabra,* &c.; Lynn, *Tilia americana;* Beech, *Fagus ferruginea;* Chestnut, *Castanea vesca;* Red Cedar, *Juniperus virginiana.*

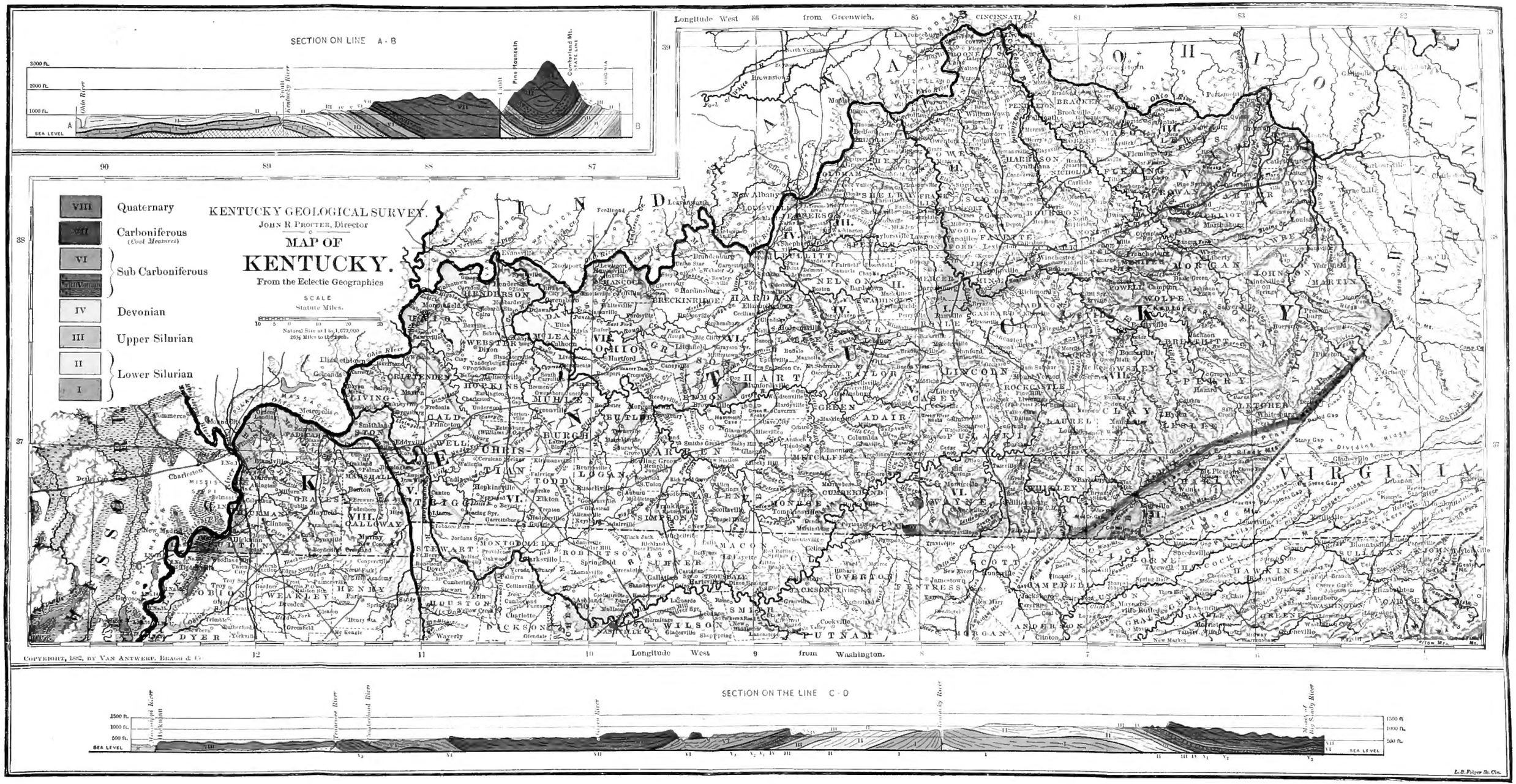
The forests and woodlands of Kentucky are excelled in variety by none, which, with the pleasing configuration of the country, and great beauty of the streams combine in producing landscapes of great beauty.

The favorable location of Kentucky has not been hitherto appreciated, as the great railway lines connecting the East and the West passed north of the State. The completion of the Chesapeake and Ohio Railway will places the State in more direct communication with the Atlantic ports, and the recently completed lines passing through the State from north to south, and others now in process of construction, will soon be felt in quickening the industries of this State. The citizen of Kentucky has the advantage of **Navigable Rivers** penetrating all parts of the State. From these it is possible to run flat-boats, barges, and rafts of timber into the Ohio river, and also by the river current, without any cost save the hire of necessary pilot and hands to man the boats, to New Orleans, thus giving to all the power of reaching ocean transportation at small cost. The United States census for 1880 places the **Center of Population** for the entire country in Kentucky, eight miles west by south from Cincinnati. The large development of mining and manufacturing in Kentucky and the adjoining States insure to the agriculturist a home market for all products.

The Financial Condition of Kentucky is most excellent. The State is practically **Free from Debt,** owing but $180,000, and having on deposit in the bank holding the bonds an amount more than enough to pay off the same. The State has at least $750,000 available assets in addition to this sum. The State **Taxation** is but 45½ cents on each $100 worth of property; and as property is rated very low for taxation, the taxes are light. Of this amount, 25 cents is for the purposes of revenue, 20 cents for public schools, and ½ cent for the State Agricultural and Mechanical College.

NOTICE.

The Kentucky Geological Survey and Bureau of Immigration, Frankfort, Kentucky, U. S. A., will furnish information to all who may apply. "Information for Emigrants" sent free of cost to any address.


SECTION ON LINE A - B
3000 ft.
2000 ft.
1000 ft.
SEA LEVEL
Ohio River
Cumberland Mt.
STATE LINE
VIRGINIA
VIII Quaternary
Carboniferous (Coal Measures)
VI Sub Carboniferous
IV Devonian
III Upper Silurian
II Lower Silurian
I
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JOHN R PROCTER, Director
MAP OF
KENTUCKY.
From the Eclectic Geographies
SCALE
Statute Miles.
Natural Size at 1 to 1,013,000
25½ Miles to the Inch.
Longitude West 86 from Greenwich. 85 CINCINNATI 81 83 82
90 89 88 87
Longitude West 12 11 10 9 from Washington. 8 7
COPYRIGHT, 1862, BY VAN ANTWERP, BRAGG & CO.
SECTION ON THE LINE C - D
2500 ft.
1000 ft.
500 ft.
SEA LEVEL
Mississippi River
Tennessee River
Cumberland River
Green River
Kentucky River
Mouth of Big Sandy River
L. B. Folger Sc. Cin.

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KENTUCKY VERSUS THE NORTHWEST.

The publications issued from this office have been designed simply to give an accurate account of the resources of Kentucky, based upon a knowledge of the facts, and to bring to the notice of persons seeking desirable homes and profitable investments, some of the advantages offered by this State.

Hitherto, no comparisons have been made between this and other States; nor would this policy have been departed from in this publication, but for the following reasons:

The Federal Government and States of the Northwest have granted immense areas of lands to railways to aid in their construction. These roads, to sell their lands and settle up the country adjacent to their lines, have established immigration agencies in this country and in Europe, and are publishing, world-wide, illuring accounts of the wonderful fertility of their lands, the delights of the climate, and the superior advantages of such lands for colonization. The severe winters of that region, the frequent droughts, the visitations of grasshoppers, and the high freights paid by the farmers to transport their produce to a market, coupled with the fact that the Southern States are now offering a most inviting field to immigrants, threatens not only to check immigration to the North and West, but evidences are strong that there is danger of an emigration from those regions to the cheap, fertile lands of the South.

To counteract this, the immigration agents representing that region are publishing statements concerning the States south of the Ohio river which are untrue and calculated to deceive. So long as these agents were content to advertise their own region, it might have been well enough to take no notice of their statements; but as they have undertaken to speak for their own section and the South, I deem it uncourteous not to reciprocate the favor, and will, in the following publication, try and

supply some of the omissions in the many flattering descriptions which are scattered broadcast respecting the much-advertised Northwest.

Some of the railways in Kentucky are now pursuing the short-sighted policy of having emigration agents, whose duty it is to disseminate the publications of the Northern and Western land agents, and offer cheap fare and other inducements to citizens of this State to move West. Knowing as I do that many persons are thereby induced to emigrate from the State, and that few of them have bettered their condition by so doing, and that most of them have been deceived by untrue statements, I deem it my duty to publish a warning to the people of this State and the South, and ask of such as contemplate removing to the West a careful study of the facts presented in the following communication.

It is my intention to confine myself to extracts from official publications of the United States Government, the State Agricultural Societies, &c., so that the information conveyed shall be conclusive and unanswerable. The haste necessary in making this compilation will render it somewhat desultory, but it will repay the reading to any one who wishes to emigrate to the region treated of.

Rain-fall.

The amount of land in the United States uniting all the conditions requisite for successful agriculture is much less than is generally supposed. Says Maj. Powell:*

> The limit of successful agriculture without irrigation has been set at twenty inches of rain-fall, that the extent of the arid region should by no means be exaggerated; but, at twenty inches, agriculture will not be uniformly successful from season to season. Many droughts will occur; many seasons in a long series will be fruitless; and it may be doubted whether, on the whole, agriculture will prove remunerative.
>
> In fact, a broad belt separates the Arid region of the West from the Humid region of the East. Extending from the one hundredth meridian eastward to about the isohyetal line of twenty-eight inches, the district of country thus embraced will be subject more or less to disastrous droughts, the frequency of which will diminish from west to east. For convenience, let this be called the Sub-humid region.

The eastern boundary of this sub-humid region passes west of the isohyetal line of twenty-eight inches of rain-fall in Minnesota, running approximately parallel to the western boundary, and including, according to Maj. Powell, nearly one tenth of the whole area of the United States, whilst the Arid region includes something more than four tenths

* Report on the Lands of the Arid Region of the United States by Maj. J. W. Powell, Washington, 1878, page 3. Since the above was written Maj. Powell has been appointed Director of the United States Geological Survey, in recognition of his eminent services.

of the United States, making in all one half of the entire country, excluding Alaska. *

Most of this region is destitute of timber, and the water supply is only sufficient for irrigation to a very limited extent.

Hon. Carl Schurz, Secretary of the Interior, says, in his Annual Report for the year 1877:

A large majority of the lands west of the one hundredth meridian are unfit for agricultural purposes without artificial irrigation, and the area on which artificial irrigation appears possible is very small.

The following respecting Colorado, is also true of the larger portion of the region west of the one hundredth meridian: †

A very large portion of Colorado is too high for agricultural purposes; so that a majority of the best and most productive soil must necessarily always remain idle. In other localities, where altitudinal conditions are more favorable, the want of an adequate supply of water prevents success in agricultural pursuits.

In 1876, Gen. W. B. Hazen, of the United States Army, prompted by a duty to humanity, published a communication on

"Our Barren Lands."‡

This publication should be carefully read by persons wishing accurate information about the region west of the one hundredth meridian.

Gen. Hazen has recently been appointed Chief of the Signal Service of the United States, and no one's opinion on the subject treated is entitled to greater weight. The following are extracts from Gen. Hazen's publication:

With the continued discoveries of gold and silver in the Rocky Mountains, and immense immigration to the Pacific coast, came the demand for more expeditious and more frequent means of communication. Railroads were exploited in many directions across the border. Some of these were justified by commerce—more were cheating schemes for the purpose of getting subsidies of land from the United States. Once in possession of this land, every effort, honest and dishonest, was made to induce persons to purchase it and settle upon it. And so, suddenly, by means of that magic power, the press, those "bad lands," "sandy plains," "wasted deserts," "el llano estacado," "basins of salt," "black hills," and so on, became fruitful as the vale of Cashmere. Here were "homes" for the "homeless," and "lands for the landless." These and other catchwords were used to ensnare the unwary.

* For information in detail, the reader is referred to Plate V of Walker's Statistical Atlas, to be seen in all public libraries.

† Tenth Annual Report of the United States Geological Survey of Colorado and adjacent Territories, 1876, page 116.

‡ Robert Clarke & Co., Cincinnati, Ohio, 1875; price fifty cents.

The efforts which were and are made to sell lands thus acquired, are familiar to the public. The fruitless, exhaustive struggle of the settler to produce something from the barren soil, his misery and destitution, only those can know whose duties station them within the confines of those worthless lands, and where they have the opportunities for personal observation. . . . .

My main proposition, that there can be no general agriculture along the line of this road, is equally true of all that immense country lying between the 100° meridian west longitude, the Sierra Nevada Mountains, the British Possessions, and Mexico. The comparative worthlessness of this great tract of land is owing to the insufficient fall of rain. From this general statement is to be excepted the very limited valleys that can be irrigated, and the beneficial effects of an occasional wet season.

These facts have been incontrovertibly proven. They are recorded in the archives of the Government, with positive statistical evidence, and this information, so well known to the intelligent people resident in this middle region, has been gained by long experience. . . . . .

By these calculations there has been given this region fifteen inches of rain annually, and lines of equal heat running near this point, that very nearly correspond with the observations of years past made at Fort Buford. Our reports at this post, which for eight years have been continuously and accurately kept, show an average of but 12.50 inches of rain-fall, two and a half inches less than shown on the rain-chart. The following is taken from the public records at the post, the upper line of figures showing the annual rain-fall, and the lower line the rain-fall of the four growing months of May, June, July, and August for the same years: 1867, $\frac{6.58}{5.17}$; 1868, $\frac{11.50}{9.31}$; 1869, $\frac{9.74}{5.23}$; 1870, $\frac{9.19}{6.23}$; 1871, $\frac{9.42}{3.98}$; 1872, $\frac{19.99}{6.77}$; 1873, $\frac{21.11}{10.73}$; 1874, $\frac{4.09}{3.34}$, to August 11.

The above is an exact copy taken from the records of the post. The actual rain for the last twelve months, ending November 1, 1874, is $6\frac{47}{100}$ inches, less than a third of that of last year.

It will be observed that only two years out of eight had a rain-fall sufficient for agricultural purposes; yet the rain-fall of those two years, 1872 and '73, were published broadcast in refutation of the statements of Gen. Hazen and other disinterested persons who had spoken truth of this region.

The following extract is from a letter of Gen. Sully, of the U. S. Army, who was stationed in the country drained by the Upper Missouri almost continuously from 1854 until 1870. He says:

The country west of Minnesota, till you come to the Missouri, is decidedly bad—a high, dry, rolling prairie, unfit for cultivation, except in a few very detached places. Alongside the very few springs in that country there are several ponds and small lakes, but few of them contain water that you can drink, and many of them dry up in summer; there is very little, in fact, you may say no timber in the country, and, as a general rule, very little rain falls during the summer. The country might do for grazing, but cattle would be obliged to roam over large sections of it, and in winter would perish for want of timber or other

means of protection against the climate, which is very severe. There are heavy snows and heavy winds, and it is very cold. The country west of the Missouri to the Yellowstone is much better in every respect, more arable land, more timber, more drinkable water, and I found in my trip across the country large deposits of coal or lignite, still I would not recommend it as a good country to settle in, and large portions of it never can be inhabited, not even by Indians. — *Written from Fort Vancouver, June* 18, 1874.

The following are short extracts taken promiscuously from letters quoted by Gen. S. Hazen :

It is a monstrous fraud and a great wrong for interested parties to induce immigration to this territory, under the plea that it is a good farming country. A residence of nearly nine years in Montana and Dakota has afforded me some knowledge of the agricultural resources of these Territories; and I fearlessly assert that, without irrigation, successful farming is an impossibility; . . . . . nor can irrigation be successfully employed, except in a few places in Montana, and not at all in Dakota.

Mr. Meeker, founder of the Greeley Colony, writes:

Agriculture without irrigation, in the countries lying between the one hundredth meridian and the Rocky Mountains, is an *impossibility*. . . In Dakota, stock must be kept during the winter, and very frequently the hay is of so inferior quality that stock fed on it alone can hardly live throughout the long severe winters, even when well housed and sheltered.

Gen. Hazen continues:

It is of vast importance that the true character of this country be made known. Every wet season, like the last two, brings great numbers of immigrants west of the productive line, who finally have to return with great loss and discouragement, as has been seen in Kansas during the present season. . . . . Professor Blodgett says, as does all tradition, that this Upper Missouri country is too dry for agriculture. Experience, in the majority of cases, still confirms it; meteorological measurements confirm it; correspondents with the Black Hills' expedition confirm it; and the boundary commission confirms it. . . . . In this region there are many years of famine, and none of plenty; so that provision for the future can never be made. Among the evils which visit it, is that of the plague of insects. Even to-day, as these words are written, there are many thousands of men, women, and children suffering from drouth and the devouring locusts. In their great poverty they ask the people of the productive States to send them help.

Maj. W. J. Twining, Chief Astronomer and Surveyor of the Northern Boundary Survey, writes:*

*Survey of the Northern Boundary, published by the Department of State, Washington, 1878, page 49.

There is, however, a limit to the extent of the arable lands fixed by the amount of the annual rain-fall. Commencing with the Valley of the Red River, where the annual deposition amounts to from seventeen to nineteen inches, the amount of rain-fall decreases, until in longitude 106° it will scarcely exceed seven inches. Here we find a fact which sets a limit to the western extension of the cultivated area of the United States.

The following tables, compiled from the records of the Smithsonian Institution, can be found more in detail in the report quoted above on the "Lands of the Arid Region," Chapter III:

TABLE I.

PRECIPITATION ON THE SUB-HUMID REGION.

Stations.	Latitude.	Longitude.	Mean precipitation per annum in inches.	Extent of record.
Fort Totten, Dakota	57° 56′	99° 16′	16.44	5 y. 5 m.
Fort Abercrombie, Dakota	46° 27′	96° 21′	18.78	13 y. 6 m.
Omaha Agency, Nebraska	42° 07′	96° 22′	25.58	5 y. 2 m.
Fort Riley, Kansas	39° 03′	96° 35′	24.52	20 y. 10 m.
Fort Hays, Kansas	38° 59′	99° 20′	22.70	5 y. 2 m.
Fort Larned, Kansas	38° 10′	98° 57′	21.42	10 y. 9 m.
Fort Griffin, Texas	32° 54′	99° 14′	21.51	5 y. 3 m.

It must be borne in mind, in studying the above table, that this is the average for a number of years. In dry years the average will be much less; but it will be seen that the general average is less than is requisite for successful agriculture:

TABLE II.

PRECIPITATION OF THE ARID REGION.

Stations.	Latitude.	Longitude.	Mean precipitation per annum in inches.	Extent of record.
Albuquerque, New Mexico	35° 06′	106° 38′	8.11	12 y. 2 m.
Camp Mohave, Arizona	33° 46′	111° 36′	4.65	9 y. 1 m.
Denver, Colorado	39° 45′	105° 01′	13.77	5 y. 1 m.
Fort Lyon, Colorado	38° 08′	102° 50′	12.56	7 y. 9 m.
Fort McPherson, Nebraska	41° 00′	100° 30′	18.96	6 y. 9 m.
Fort Rice, Dakota	46° 32′	100° 33′	11.39	6 y. 1 m.
Fort Randall, Dakota	43° 01′	98° 37′	15.52	15 y. 6 m.
Fort Stockton, Texas	30° 20′	102° 30′	11.50	5 y. 8 m.
Fort Belknap, Texas	33° 08′	98° 46′	28.05	5 y. 10 m.

Maj. Powell says (page 56) of Arizona and New Mexico:

In all this region the daily range of temperature is great, and frosts occur so early in autumn that no use can be made of the autumnal rain-fall. The yearly precipitation is very small, and the summer quota rarely exceed seven or eight inches.

The arguments that the rain-fall will increase with the coming of man on the western plains is shown to be fallacious by the following statement from report quoted above (page 74):

The area affected by grazing is far greater than that affected by farming. Cattle, sheep, and horses have ranged through all the valleys, and upon all the mountains. Over large areas they have destroyed the native grasses, and they have everywhere reduced them. Where once the water from rain was entangled in a mesh of vegetation, and restrained from gathering into rills, there is now only an open growth of bushes that offer no obstruction. Where once the snows of autumn were spread on a non-conducting mat of hay, and wasted by evaporation, until the sunshine came to melt them, they now fall upon naked earth, and are melted at once by its warmth.

If the above statement be true, the air must become dryer, and the amount of rain-fall less, and the waste of the water so great that little would be available during the summer months for purposes of irrigation.

Timber and Woodlands.

The great area extending across the United States from north to south between longitude 97° and the Rocky Mountains is almost destitute of forest growth. Probably not one per cent. of this area is woodland. The need of forests is so well told in the great work of George P. Marsh, that I advise all who can obtain access to it to read it. In discussing the due proportion of woodland requisite, he says: *

The proportion of woodland that ought to be permanently maintained for its geographical and atmospheric influences, varies according to the character of the soil, surface, and climate. In countries with a humid sky, or moderately undulating surface and an equable temperature, a small extent of forest, enough to serve as a mechanical screen against the action of the wind in localities where such protection is needed, suffices. But most of the territory occupied by civilized man is exposed, by the character of its surface and its climate, to a physical degradation which cannot be averted except by devoting a large amount of soil to the growth of woods.

From an economical point of view, the question of due proportion of forest is not less complicated or less important than in its purely physical

*The Earth Modified by Human Action: New York, 1877, page 302.

aspects. Of all the raw materials which nature supplies for the elaboration of human art, wood is undoubtedly the most useful, *and at the same time most indispensable to social progress. . . . . Upon the whole, taking civilized Europe and America together, it is probable that from twenty to twenty-five per cent. of well-wooded surface is indispensable for the maintenance of normal physical conditions, and for the supply of materials so essential to every branch of human industry and every form of social life, as those which compose the harvest of the woods.*

In a littoral region such as England, with abundance of coal for fuel, a humid climate, and easy access by water transportation to timber supplies, the area of woodland necessary may be small; but in a region like the Northwest, remote from the sea, with a small rain-fall, and hot, dry climate in summer, and extreme severity in winter, a scarcity of coal for fuel, and where farm animals require shelter for more than half the year, the necessity for a large area of woodland is very great. So much so, that large bounties are offered for the planting of timber, and efforts are made to avert the want and suffering experienced by the scarcity of timber; yet, at the same time, the publications sent abroad from that region tell of the advantages of a treeless region, and treat of woodlands as an absolute evil which the immigrant to the West may avoid. In this connection, it may be well to glance at some of the arguments advanced by the enlightened citizens of that region, showing the needs of timber-planting.

Mr. Leonard B. Hodges, in a communication addressed to the Governor of Minnesota, January, 1874, takes three counties in that State as a fair average of twenty-five counties in Western Minnesota in which timber-planting may be regarded as an urgent necessity. In these counties there is but one tenth of an acre of timber to one hundred acres of prairie.

Mr. Hough also says of Minnesota: *

The most urgent need of timber-planting is felt not merely to create a supply of material for fuel and farm purposes, but to afford protection to man and beast, and to farm and orchard, against the fierce northern winds of winter and the drying southwest winds of summer. The necessity of timber-belts as a shelter from storms was never, perhaps, more severely felt than in a storm of memorable severity which swept over several of the Northwestern States on the 7th, 8th, and 9th of January, 1873, where, in the absence of such protection on the prairies, suffering and death were reported from very many points. This storm was particularly severe in Minnesota, but was felt with great force over

* Report on Forestry, by Franklin B. Hough, Department of Agriculture, Washington, D. C., 1879, page 533.

a region extending from Manitoba and Dakota to Wisconsin and Illinois and in Kansas and Nebraska. *

In **Iowa** the want is much felt:

In this State,† as in others of the prairie region, the timber question arises in the beginning of settlement, and the want of timber products being among the very first that is felt by the emigrant, his attention is naturally directed at once to the subject of supply. The timber belts along water-courses were *in very many cases exhausted in the early years of settlement*, and supplies of lumber have been brought in later years from regions further east by railroads. But neither of these sources of supply are sure of indefinite continuance.

The Standing Committee on Forestry in the Iowa Horticultural Society in January, 1872,‡ referring to the change for the worse in the climate of that State since the settlement began, declare it to be within the knowledge of all old residents:

That a marked change for the worse has taken place within the last twenty years. . . . The only remedy against this great and increasing evil is tree-planting and wind-breaks.

The necessity of screening fruit trees in Iowa is thus shown:§

Timber belts should be planted on the south, west, and north sides. It was particularly necesssary to shelter trees against the drying southwest winds, which were quite as injurious as those from the northwest, being warmer and more exhausting.

Prof. H. H. McAfee, formerly of the Iowa Agricultural College, remarks|| that:

Prairie farms need shelter most on the west, next on the north, next on the south, while their usefulness on the east is not so great, *though sufficient to call for planting.*

Need of wind-breaks for the protection of human life.

A winter¶ seldom passes without deaths from storms on the prairies of the Northwest.

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* In this connection, it would be interesting to study Plate VI of Walker's Statistical Atlas, giving the frequency of storm centers.

† Report on Forestry by F. B. Hough, U. S. Agricultural Department, 1877, page 551.

‡ Iowa Horticultural Report, 1872, page 133.

§ Prof. H. H. McAfee before the American Forestry Association in Philadelphia, 1876.

|| Iowa Horticultural Report, 1875, page 292.

¶ F. B. Hough, Report on Forestry.

Mr. James T. Mott, after seventeen years' residence in Iowa, says:*

I have many times wondered how it could be that people were so easily lost in these storms; why it was that a man in good health, strong in limb, and well clothed, could not go a few yards from his house to the barn to care for his stock, without danger of death; why whole sleigh-loads of people were frozen to death within a hundred rods of dwellings, and this in the same location where I was living. But lately it has been my fortune (or I thought at the time my misfortune) to be caught in one of these storms in Minnesota; and it took only a short time for me to see through the whole thing. I felt the wind first blowing softly from the south; in thirty minutes it changed to a fierce gale from the west, bringing with it a bank of snow that would compare to the rush of water as the flood-gates are opened in a mill-race, and with a force that no man or team could travel against it a mile, as steady as in a bellows run by machinery, being filled with snow as fine as the finest dust, and so thick one could not see ten feet. The storm lasted three days, . . . and the news is of hundreds dead; people frozen in stage-coaches, whole sleigh-loads returning home from town; men standing dead with hand on stable-door latch; others that saved themselves by burrowing in snowbanks; little children lost going home from school; passengers in railroad cars two days without food, &c. . . . *More people have frozen to death in Northwest Iowa and Western Minnesota than were ever murdered by Indians in those countries since their settlement.* . . . The people are now petitioning their Legislature for some kind of protection from these storms; asking that wire fences and storm-houses be built along the traveled roads, asking them to do something for their safety. I see none that would do but timber planting.

The demands for timber in that region much exceed the supply. The ravages of the grasshopper, the droughts, and severity of winter, render it certain that there is slight hope that timber culture can remedy the evils complained of. The winter just passed has been more severe than the one described above.

The cost of growing the European larch, which is reckoned a tree of easy growth, until it is eight years old, is placed at $140 per acre.† At this cost, we can hardly expect extensive tree culture in the West.

So much for Iowa. To the west, in Nebraska and Dakota, the evils are more serious. Let us glance at the conditions of other States of the Northwest.

In Michigan:

Facts are not wanting‡ to prove that changes in the climate had already taken place. The winters within the last forty years have been growing more severe. . . . . The destruction of wheat, as well as

* Iowa Horticultural Report, 1872, page 109.

† Iowa Agricultural Reports, 1870, page 328.

‡ Appendix to Report of Michigan Board of Agriculture, 1866.

the corn crop, is a matter of great anxiety to our farmers in many sections; and the winter-killing of clover in the eastern part of the State last winter, not by heaving, but apparently frozen dead in the ground, and appearing black and rotten in the spring, may be another proof of climatic changes of great significance to the farmer and dairyman.

The need of timber in Illinois as a shelter from winds is thus shown by Mr. O. B. Galusha, of that State: *

In the year 1862, at the time when spring wheat and oats in the northern portion of the State were just past their bloom, and a portion of the grain in the milky state, we were visited by a storm from the northwest, which swept over this portion of the State, prostrating nearly all the grain not sheltered by timber. . . . . .

Mr. Galusha estimates the amount of grain destroyed by this storm in Illinois at $5,460,000, and adds:

I think it may be safely estimated that *an average of one twelfth part of all of our crops of grain and large fruits are destroyed by violent winds.*

In **Nebraska** the need for timber-planting as a shelter against the severe storms of winter and the parching winds of summer, is greater than in any of the States yet named. Mr. D. C. Schofield has put the necessity in very strong language in an address delivered at the Nebraska State Fair: †

Our pine forests, from the lakes to the Atlantic, have been nearly swept away, and the remaining pine lands will not continue more than twenty years at the present ratio of consumption, which must increase in a geometrical ratio as population and business increases.

No great degree of prosperity and thrift can for a long time bless this timberless country when nearly all the timber and wood material for all purposes are imported at high rates.

The futility of all attempts to supply the large and growing demand by tree-planting is thus shown: ‡

The timber question is the most important and all-absorbing one to Nebraska farmers, as our young and prosperons State bears the reputation abroad of being the most destitute of timber of any other west of the Missouri river. After approximate estimate, our State contains about one acre of timber to every two hundred of prairie, and the present waste and decrease is about five acres to every one acre planted and cultivated.

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* Lecture at the Illinois Industrial University, 1869.

† See Fourth Annual Report State Board of Agriculture of Nebraska, page 406.

‡ Same Report, page 445.

In **Kansas** the timber area was estimated in 1872 at 4.92 per cent., chiefly in the eastern part of the State. This area has been much reduced since then by the large demands for lumber and fuel in that State.

Mr. Manhattan, of Kansas, thus speaks of the want of timber screens in that State: *

I have seen the soil in exposed situations blown away to a depth of six inches, or as deep as the land had been plowed, in a single season. An effective shelter-belt would not only remedy this evil, but would serve largely as a preventive of drought; first, by measurably warding off the dry, hot winds that sometimes sweep over the country as a blighting, withering curse; and secondly, as a shelter for the snow that is otherwise blown away into the ravines and hollows where it is not needed; and again, in breaking the force of the fierce storms that almost every season do more or less injury to the growing corn and other farm crops.

Many other facts could be cited, but enough has been given to show the want of timber in the Northwest as a protection. The wants for fuel and building material are great and increasing. The severe winters render shelter for stock imperative. It would be easy to show, from the reports of Geo. B. Emerson and others, who have made a study of the resources of the pine regions around the great lakes, that the supply from that region will be exhausted in ten or twelve years.† The Northwest must then depend on the South for its supply of timber, and the distance is so great that the freights will add much to the cost of the timber. South of the Ohio river, as fast as timber is cut down, new woods grow up, unless the land is put in cultivation; and whenever land is abandoned, the young trees grow up with great rapidity. Unlike the experience of the more humid regions of the Atlantic States, timber-culture west of the Mississippi has difficulties to encounter which require energy and patience to overcome. During the past summer the grasshoppers proved very destructive to young trees, especially to seedlings.

Climate.

I find upon examination that nearly, if not all of the immigration publications from the Northwest, attack the climates of the States south of the Ohio river. A comparison of climates is therefore desirable. It will be seen, from examination of the temperature chart published in the United States Statistical Atlas (Plate VIII), that Virginia, Western North Carolina, Northern South Carolina, Northern Georgia, Northern Alabama, Tennessee, and Kentucky have a mean annual of from 52° to 60°.

* Transactions of the Kansas State Horticultural Society for 1875, page 113.

† See proceedings of Northwestern Lumbermen's Association, held at Chicago, 1881.

The maximum mean temperature in the summer of 1872 in this region was 90° (at 4:30 P. M., during the hottest week), and the minimum for the coldest week, at 7:30 A. M., was +20°. This should be sufficient to establish the salubrity of this climate. I have compiled the following tables from the publications of the United States Signal Service Department. I have taken 1872, so that comparison can be made with the very cold winter just passed, as it will be argued by Northwestern immigration agents that the winter of 1880–'1 is an exceptional winter:

BRECKINRIDGE, MINNESOTA.

MAXIMUM, MINIMUM, AND MEAN TEMPERATURE.

MONTHS.	Maximum.	Minimum.	Range.	Monthly Mean.
October, 1872	81°	13°	68°	45°
November, 1872	51	—18	69	21
* December, 1872	37	—35	72	0°
† January, 1873	34	—39	73	2°
February, 1873	39	—30	73	8°
March, 1873	43	—32	75	16°
April, 1873	60	23	40	35
May, 1873	74	29	45	52
June, 1873	94	47	51	69
July, 1873	97	44	53	67
August, 1873	89	45	44	67
September, 1873	80	23	61	49

* From 15th to 28th of December ranged from 13° to 35° below zero.
† Below 0 22 days.

KEOKUK, IOWA.

MONTHS.	Maximum.	Minimum.	Range.	Monthly Mean.
October, 1872	80°	27°	58°	55°
November, 1872	60	— 3	63	34
December, 1872	47	—22	71	20
January, 1873	35	—26	73	17
February, 1873	49	—11	60	26
March, 1873	72	— 2	74	38
April, 1873	83	32	51	48
May, 1873	83	43	43	61
June, 1873	96	49	47	77
July, 1873	96	56	40	76
August, 1873	102	56	46	78
September, 1873	90	40	49	63

LEAVENWORTH, KANSAS.

Months.	Maximum.	Minimum.	Range.	Monthly Mean.
October, 1872	87°	31°	56°	56°
November, 1872	68	0	68	35
December, 1872	55	—13	70	21
January, 1873	36	—29	77	19
February, 1873	62	— 9	71	30
March, 1873	73	7	66	42
April, 1873	82	26	59	48
May, 1873	85	43	42	63
June, 1873	97	58	44	75
July, 1873	94	55	39	77
August, 1873	99	55	44	79
September, 1873	91	38	53	65

OMAHA, NEBRASKA.

Months.	Maximum.	Minimum.	Range.	Monthly Mean.
January, 1873	46°	—20°	66°	16°
February, 1873	57	—11	68	26
March, 1873	67	— 3	75	38
April, 1873	74	27	49	44
May, 1873	86	37	49	59
June, 1873	93	51	42	74
July, 1873	94	51	43	75
August, 1873	98	53	45	77
September, 1873	91	41	61	60

For same year thermometer fell at Pembina, Dakota, to — 30° in November; —51° in December; —36° in January; —32° in February; — 25° in March; 18° in April.

LOUISVILLE, KENTUCKY.

Months.	Maximum.	Minimum.	Range.	Monthly Mean.
October, 1872	85°	33°	52°	56°
November, 1872	62	4	58	37
December, 1872	61	— 4	65	29
January, 1873	64	— 4	68	31
February, 1873	68	7	61	36
March, 1873	71	3	68	43
April, 1873	87	35	52	54
May, 1873	88	48	43	67
June, 1873	95	51	44	78*
July, 1873	93	58	35	79
August, 1873	93	59	34	78
September, 1873	94	44	52	69

*The monthly mean for the months of June, July, August, and September at Lexington, Kentucky, was 73°, 76°, 73°, 66°, or less than Keokuk, Iowa, or Leavenworth, Kansas.

Fort Garry, Montana.

No reports received previous to December 8th, 1872. The mercury fell below zero, and the following is the remarkable record for December, from the 8th:

December 8, —21°	December 16, —32°	December 24, —41°
" 9, — 4	" 17, —36	" 25, —26
" 10, —15	" 18, —34	" 26, —32
" 11, —20	" 19, —33	" 27, —35
" 12, — 9	" 20, —31	" 28, —21
" 13, —17	" 21, —38	" 29, —25
" 14, —14	" 22, —35	" 30, —11
" 15, —26	" 23, —35	" 31, —11

The thermometer fell to —35° in January; —36° in February; —36° in March; and +16° in April, and rose to 90° in June; 93° in July; and 94° in August.

This will give the English reader an idea of the climate in Manitoba, as Fort Garry is near the line.

Saint Paul, Minnesota.

Thermometer fell to —14° in November, 1872; —31° in December; —26° in January, 1873; —22° in February; —22° in March; 27° in May; and rose to 91° in June; 92° in July; and 89° in August.

La Crosse, Wisconsin.

Thermometer fell to —14° in November, 1872; —37° in December; —43° in January, 1873; —32° in February; —23° in March; 25° in May; and rose to 96° in June; 95° in July; and 94° in August.

FORT SULLY, DAKOTA.

Thermometer fell to —15° in November, 1872; —30° in December; —35° in January, 1873; —25° in February; —12° in March; 18° in April; and rose to 108° in June; 108° in July; 107° in August; and 100° in September.

MAXIMUM AND MINIMUM TEMPERATURE FOR DECEMBER, 1880, AND JANUARY AND FEBRUARY, 1881.*

STATES & TERRITORIES.	DECEMBER, 1880.		JANUARY, 1881.		FEBRUARY, 1881.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Dakota	58°	—45°	54°	—55°	65°	—34°
Iowa	56	—25	48	—40	57	—24
Kansas	68	—22	56	—21	65	—24
Kentucky	63	— 7	63	— 8	67	+ 6
Michigan	50	—23	43	—26	54	—27
Minnesota	40	—42	35	—44	34	—33
Montana	60	—59	47	—32	65	—29
Nebraska	65	—26	64	—32	57	—29

* Compiled from "Monthly Weather Review" from the United States Signal Service Department. I have not yet received the official records for the month of March, but the press dispatches from the Northwest are burdened with the tales of suffering from snow and cold, railroad trains blockaded for weeks, families wanting fuel and food, one half the cattle in some States reported killed, and now, as I write (March 31), comes sad news of floods, great destruction of property, ice breaking, damage great, loss of life. And yet the cry is "Go West."

The foregoing tables and extracts relative to the need of timber shelter are sufficient to show the severity of climate in the region treated of. Think of the drawbacks to successful agriculture in a country like Dakota, where the thermometer ranges from —40° in winter to 112° in the shade in summer! * or in Kansas, with a range of —26° in winter to 108° in summer; † or in Iowa, where—‡

The severe heat in summer, cold in winter, and droughts in various parts of the season, are sufficient to kill most plants and trees that are less hardy than the hardy oak trees in our forests.

Grasshoppers.

The greatest drawback to success in agriculture in the great West, next to the scarcity of timber and want of rain, is the devastation of the grasshopper, the ROCKY MOUNTAIN LOCUST (*Caloptenus spretus*). This will be found in the valuable report of the United States Entomological Commission, published by the Department of the Interior. §

* See Report of Lieut. Sharp, 1st Infantry, U. S. Army.

† Kansas Agricultural Report, 1874, page 364.

‡ Transactions of Iowa Horticultural Society, 1879, page 301.

§ Washington, Government Printing Office, 1878.

The following is a tabular view of the years in which the Rocky Mountain Locust has appeared, from the earliest date known, up to and including the year 1877. *

For want of room, I have omitted from the table Texas, Arkansas, † Indian Territory, Missouri, New Mexico, Arizona, Nevada, Washington Territory, and Oregon:

As may be seen by reference to the foregoing data, in most of these years the actual loss to crops was more or less slight. The years in which losses were sustained by the young hatching in the spring, and in which there were afterwards in that season no invasions, are starred. The years in which more or less severe damage was done are in full-faced type.

TABULAR VIEW OF LOCUST (*C. spretus*) YEARS.

Kansas.	Nebraska.	Iowa.	Minnesota.	Dakota.	Montana.	Wyoming.	Colorado.	Utah.	British North America.
. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	**1851**	. . . .
. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	1852	. . . .
. . . .	. . . .	. . . .	. . . .	1853	. . . .	. . . .	. . . .	1853	. . . .
1854	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	1854	. . . .
. . . .	. . . .	. . . .	?1855	. . . .	. . . .	?1855 or	. . . .	**1855**	. . . .
1856	. . . .	1856	1856	. . . .	. . . .	1856	. . . .	**1856**	. . . .
1857	1857	1857	1857	. . . .	. . . .	1857	. . . .	1857	1857
. . . .	*1858	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	1858	*1858
. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	1859	. . . .
1860	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	1860	. . . .
. . . .	1861	. . . .	1861	. . . .	1861	. . . .	. . . .	1861	. . . .
. . . .	. . . .	. . . .	. . . .	. . . .	**1862**	. . . .	. . . .	1862	. . . .
. . . .	. . . .	. . . .	1863	1863	1863	. . . .	. . . .	1863	. . . .
. . . .	**1864**	1864	1864	1864	1864	. . . .	**1864**	**1864**	**1864**
. . . .	.	*1865	1865	1865	**1865**	. . . .	**1865**	1865	*1865
1866	**1866**	1866	1866	1866	**1866**	. . . .	1866	**1866**	. . . .
1867	**1867**	**1867**	1867	1867	**1867**	. . . .	*1867	**1867**	. . . .
1868	*1868	1868	. . . .	1868	1868	. . . .	. . . .	**1868**	. . . .
*1869	. . . .	. . . .	1869	1869	**1869**	. . . .	1869	1869	. . . .
. . . .	. . . .	1870	1870	1870	1870	1870	. . . .	1870	. . . .
. . . .	. . . .	*1871	1871	1871	1871	. . . .	. . . .	**1871**	. . . .
1872	. . . .	. . . .	1872	1872	1872	. . . .	1872	1872	**1872**
. . . .	1873	1873	1873	1873	1873	**1873**	*1873	. . . .	*1873
1874	**1874**	**1874**	**1874**	**1874**	**1874**	**1874**	**1874**	. . . .	**1874**
***1875**	***1875**	*1875	*1875	**1875**	**1875**	**1875**	**1875**	1875	**1875**
1876	**1876**	**1876**	**1876**	**1876**	**1876**	**1876**	**1876**	**1876**	**1876**
*1877	*1877	*1877	1877	1877	*1877	*1877	*1877	*1877	*1877

*There was only a very slight visitation in the extreme northwestern corner of Arkansas during 1876 and 1877.

† I have given table since 1850 only. See complete table, page 113, of the first annual report of the U. S. Entomological Commission.

Speaking of the loss in the four States of Iowa, Missouri, Kansas, and Nebraska, the Commission says: *

We have an aggregate loss in the four States mentioned for the year 1874 by the locusts of about $56,000,000. This estimate, we believe, is fully sustained by the facts, and if erroneous, it is not because the losses are exaggerated, but for the reason that they are underestimated. It is certainly much less than any made from local estimates. . . . . Calculating in this way, we see that the actual loss to these four States in a single year by this terrible scourge amounted to at least $100,000,000.

The loss in grain in Minnesota was, in 1875, 4,141,230 bushels, and in 1876, 7,031,151 bushels.†

The loss in grains alone in Western Missouri for the year 1875 was $15,000,000.

The loss in the Western States during years of worst visitation is estimated by the Commission at at least $200,000,000.

The loss of grain in the portion of Minnesota visited by grasshoppers in 1876 amounted, according to the reports of the Commissioners of Statistics, to fifty per cent. of the entire wheat crop in those districts, fifty-nine per cent. of the oats, fifty-one per cent. of the barley, and sixty-one per cent. of the corn. The detailed reports from the various counties in Kansas and the Northwestern States ravaged in 1877, published in Appendix XX of the U. S. Entomological Report, furnish a distressing picture of devastation, which persons wishing to emigrate to those States should study carefully.

The chronological history of the invasions is clearly given in chapter II of the above mentioned report. Taking Kansas as an example, and beginning in 1869, I take a few extracts:

1869. For two years, apparently, the progeny of those which overrun the State in 1866–'67 remained and did some damage.

1872. This year "foreign" locusts did some harm in parts of Kansas. At Beloit they appeared in the last week of August, and devoured everything green.

1873. While Nebraska and the country to the north was generally overrun in 1873, there is no record of their appearance in Kansas.

1874. This was the worst year in Kansas; the State, like its neighbors north and south, suffered extremely. Mr. Riley, in his Seventh Report, says the locusts swept over the State "in overwhelming hordes from the plains of Colorado on the west, and the fields of Nebraska on the north, in many instances clearing off all traces of vegetation in a few hours." The corn crop was ruined by them. They appeared in every county. . . . . The suffering was great, thirty counties reporting

* Page 121.

† Same Report, page 122.

one thousand eight hundred and forty-two families, aggregating nine thousand one hundred and fifty-four persons, *reduced to destitution.*

1875. In this year the damage done was by the young locusts, which hatched in enormous numbers in the eastern part of the State. . . . . (Riley's Eighth Report.) The writer passed over the ravaged region along the Kansas Pacific Railroad just after the locusts had taken flight, and witnessed the bare fields, desolated towns, and general ruin they left behind along this part of the country. They flew out of the State, and there were no invasions from the north or west that year, and no damage done after the middle of July. Still, *owing to the fear of disaster*, there was said to be a heavy emigration of farmers from the State.

To be replaced by the duped ones from the Eastern States and Europe.

1876. There were fresh invasions from the North from late in July until early in September. "Early in September the swarms thickened, and the wind blowing almost a gale from the west and northwest for two or three days subsequently, the insects during that time swept down in darkening clouds over the greater portions of the State from the 98th meridian to beyond the 96th." (Riley's Ninth Report.) Mr. Gaumer states that the invading swarms in the autumn deposited their eggs in almost every available place throughout all the counties in Southeastern Kansas.

1877. Although much trouble was expected from the young locusts this year, yet owing to the exceptionally wet and cold spring and early summer the young died soon after hatching, and did little local injury.

It is very interesting to read the reports from the various counties of Kansas ravaged by grasshoppers in 1876, at the time that agents of Kansas railroads were so vigorously disseminating immigration documents at the Centennial Exhibition. One county reports:

There have been more locusts this year than in 1874; millions have died, *probably of starvation.*

Think of that, ye who leave comfortable homes in Kentucky and the South for the "delightful plains" of Kansas—a country too barren to keep grasshoppers alive!

The official report of the Commissioner of Agriculture of Kansas for 1874 reports 12,089 persons requiring food—counties unable to provide for their destitute, and—

18,134 requiring assistance for other than rations. . . . . Destitution is greater than has been supposed. Our people are not beggars; and there have been many cases of suffering where delicacy has hidden it from public view as long as possible. . . . . An important consideration seems to have been overlooked. Farmers are compelled to feed wheat to work animals. Bad results are already apparent in many localities. It is an unnatural food for work animals, and unless corn can be provided for spring work, at least in part, there will not only

be disease and suffering among the stock, but farm industries will be retarded. *

A few extracts from county returns to the board will convince any one that the above report stated the case very mildly. I leave the names of counties blank, as they represent no worse condition than many others not named: †

——— county. 517 persons in need of help; . . . . . few can find employment for themselves or teams to earn any part of a living.

——— county. Probably one fourth of our people will need help of some kind. *Large fall immigration now coming in.*

——— county. Commissioners state that about 500 families will need assistance during the winter. Many of the people need present assistance, their crops having entirely failed.

——— county. I think about two thirds will have to be assisted to some extent.

——— county. The county clerk reports 600 people as requiring assistance; a good many leaving, and more will go without assurance of aid.

——— county. Three fourths of the inhabitants actually destitute; need immediate aid.

——— county. 750 individuals will need assistance; crops a failure; nothing to feed domestic animals; about one fourth of our people will return to the older States.

——— county. It is stated that from 1,000 to 1,200 persons will need assistance.

——— county. 469 families, averaging four persons each, will need assistance. . . . . Not less than one half will require to be supported until another crop can be made.

——— county. At least one half must have help or suffer materially.

——— county. Having traveled over the largest part of the county, I find that about three fourths of our people are almost entirely destitute of food, fuel, and clothing.

——— county. 1,350 in destitute circumstances that the county will be unable to provide for. Agents have been sent East, with indorsements of county societies, to solicit aid.

——— county. 600 families in this county in need of help. . . . . People say they will suffer before increasing taxes, which are already too heavy to bear.

The reports to the Kansas Board of Agriculture for 1876 are but a repetition of the quotations above from the report of 1874, and the extracts quoted on page 21 from the Atlantic Monthly, showing the destitution in 1879, demonstrate that these are not exceptional years; but that the emigrant to Kansas and the Northwest must calculate on encountering such years very frequently. The eastern limit of the

* Third Annual Report Kansas Board of Agriculture, page 53.

† Same Report, pages 17 to 52.

spread of the Rocky Mountain locust is fixed by Prof. Riley west of the Mississippi river, and his arguments against the possibility of extending further east than the imaginary line fixed in his report and on the maps, will be found in his able report for 1878, page 137.

Hitherto, I have confined myself to quotations from official publications, not by any means exhausting the material at my disposal, but reserving for future use, should the statements quoted above be questioned. I will now give a few extracts from reliable publications from impartial sources; using none from publications south of the Ohio river, as I am determined that the impartiality of this communication shall be unquestioned.

The following extracts are from an article in the Atlantic Monthly for December, 1879,* entitled "KANSAS FARMERS AND ILLINOIS DAIRYMEN:"

On the 10th of June last (1879) I left Boston to make a tour through the grain-producing sections of the West, for the purpose of examining the operations of the small farmer, and of his new competitor upon the great bonanza farms of Kansas, Minnesota, and Dakota; to learn, if possible, what are the actual conditions there obtaining, and to what extent, if any, an opportunity is offered for the remunerative employment of the idle and distressed among the people. It is my intention in this paper to confine myself closely to the facts thus ascertained.

On my arrival at Topeka, the Capital of Kansas, I was particularly struck with the inquiry that appeared to be on the tongues of all, and was being discussed by the press, and by the State officials, from the Governor down, as to the ways and means of providing for the support, during the coming winter, of the great number of *destitute farmers*,† and others in that State. At the same time, the *State, through every available avenue, was inviting and receiving a large immigration of settlers upon its lands, and assuring the world that her soil offered competence and comfort to every worker.* . . . .

The plains are dotted with farm-houses at intervals of from half a mile to ten miles. The larger portion of these dwellings are mere shanties or sheds, that, at a little distance, have the appearance of dry goods boxes, standing in the plain without fence, tree, or out-house that offers the least cheer or relief to the eye. A near approach reveals a rough wooden box, about fourteen or fifteen feet square, of one story, and usually one room—rarely two or more—unlathed, unplastered, without paint inside or out, with very little household furniture, and generally with pipe of the cook-stove projecting through and a little above the roof. These shanties are often without frames, the boarding being upright, and the cracks battened. A residence more desolate or uninviting it is difficult to imagine. . . . Barns, large or small, are seldom seen, the shelter for animals or tools being generally formed by placing

*Houghton, Osgood & Co., Boston, Vol. XLIV. This can be found in all public libraries, and I advise the reading of the entire article.

†Who ever heard of a *destitute farmer* in Kentucky?

two opposite rows of stakes or posts, about fourteen or sixteen feet apart, for the space required, and laying other poles across the tops, upon which is piled straw or hay. . . . . Kitchen gardens are rarely seen, and where commenced, appear generally to have ended in partial or total failure. . . . I was told there had been no general rain for eight months, and all through May and June there had been the same dry, hot winds, with an occasional local tempest of hail, or rain and wind and lightning, that destroyed everything in its path. On my way to Pueblo and back, I continually met and saw emigrants coming to and fleeing from the country. Everywhere I was told of settlers who would go, if they had or could find the means of getting away. . . . In the car with me, on my way to Pueblo, were a man and woman, evidently of the better class of farmers, sunburned and toil-worn; . . four years ago he came from Pennsylvania, where he farmed, and took up a quarter section of land under the homestead law. . . . He had improved the place with good buildings and fences, and stocked it with cows enough for a small dairy, besides work animals; but he had not been able to raise any crops that gave the least encouragement till last year, when everything was produced in the greatest abundance; yet he could not get enough for his wheat and corn to pay cost, and leave any profit. . . . He had not succeeded in raising anything, and his stock of animals were actually perishing for want of pasture. A new-comer had offered him a small price for his improvements, which he was glad to take and get away, because, without having to pay either interest or taxes of any sort or debts of any kind, he could not get a living, and must go. . . . He was very emphatic in the statement that those who had bought land upon credit, paying interest at seven per cent., could not, by any possibility, get out of debt or live decently; that all of the small farmers, even the best of them, would be glad to hire out by the day or month, but work was not to be had. . . . I visited the Massachusetts Colony of New Boston. . . . All have worked hard, and, under many difficulties, succeeded in getting some ground into corn, wheat, potatoes, and other vegetables; but the drought and insects made sad havoc with the crops. There was a feeling of great discouragement, and some of the colonists were making efforts to get back to the East, where, as they said, at least food might be had. Where they are now it is difficult to get meat and bread enough to sustain life.

The above are brief extracts from an article which should be carefully read to be appreciated. In the Atlantic Monthly for January, 1880,* there is an article, entitled "The Bonanza Farms of the West:" showing the operations on the large wheat farms in Minnesota, Iowa, Dakota, and Kansas, and the general tendency in those States to these immense farms, cultivated mainly with machinery, and employing a minimum amount of human labor. After giving the profits on some of these large farms, the writer adds (page 42):

On the other hand, the small farmers, depending mainly on their own labor, with limited capital and less machinery, are not making a com-

*Vol. XLV.

fortable subsistence, but are running behindhand, and must go under. . . . But the imperative laws of the seasons have limited the time of effective industry of the farmer to about one fourth part of the year,* during which time the small farmer must make provision for all his force for the full year. . . . . But with the capitalistic farmer it is very different. The facts that I have gathered show that upon the Grandin farm, for example, during the four weeks of seed time there were one hundred and fifty men employed; and for the six weeks of harvest there were two hundred and fifty men, at wages that would barely support the workers during the time they worked; for the five months from November 1st to April 1st, there would be only ten men, as estimated, but in fact only five were employed during that period of the past season, with neither woman or child at any time. While the small farmer is compelled to feed, clothe, shelter, and altogether provide for the same number of persons for the whole year, the capitalist feeds, clothes, and shelters only about one fourth of the number, in proportion to the amount of work done, and that for less than one fourth of the year.

In doing this, the capitalist brings to his assistance the most improved and highly developed machinery, such as the small farmer can utilize to but a comparatively slight degree.

Against the ultimate use of this combination of capital, machinery, and cheap labor, the individual farmer, either singly or in communities, cannot successfully contend, and must go under. . . . .

The development of the large farm interest has the direct and immediate effect of impoverishing the sections in which the farms exist, and skinning the lands without any compensating benefits. Not one dollar of the gross amount or net profit received from the products of the soil is returned and placed upon the land from which it is taken, except in the construction of the fewest buildings necessary to shelter and protect the laborers in the working season, and for the care of the work stock and tools.

Taking one farm of five thousand three hundred cultivated acres as an example, there was not one family finding a permanent home by virtue of title in the soil. Where there should be a population of five hundred, "there is not one fixed inhabitant, with all the accessories of household comforts and home improvements." It will be seen from a comparison of the U. S. Census of 1870 with that of 1860, that whilst in the States of the Northwest the number of large farms increased, that in Kentucky and the Southern States, for the same period, the number of large farms decreased, and the number of small farms largely increased; for instance, in Kentucky, the total farms of less than one hundred acres each increased from fifty-eight thousand three hundred and fifty in 1860 to ninety-two thousand one hundred and forty-nine in 1870.

*Contrast Kentucky or Virginia and the South, where the farmer may engage in "*effective*" *productive* labor for the entire year.

Superiority of Kentucky Soils.

I cannot better state the difference between the soils of this State and those of the Northwest than by quoting from Dr. Robert Peter, Chemist of the Kentucky Geological Survey—an agricultural chemist and practical agriculturist of large experience:*

Hence geologists inform us that, even in strata which had been deposited or formed at the same geological time, the rock-layers at the North are sometimes formed of coarse-grained, insoluble, silicious material, while those farther South and West are limestones, or fine-grained shales, rich in phosphates and other soluble materials.

Another geological cause of the comparative fertility of Kentucky soils is, that these rock strata, out of which they were formed, and which are made up of the most finely divided or soluble materials, were raised above the general surface of the primeval ocean very early in geological history, and have therefore been exposed to the disintegrating influence of the atmospheric agencies for immense unknown ages, so that soils formed of these rocks alone have been gradually produced to a much greater depth than is to be observed in almost any other country. Soils thus formed, in place, out of the rock strata on which they rest, are called by writers *Sedentary soils*, and said to have usually little depth. They are hardly known over the broad expanse of our continent north and west of Kentucky, the whole of that extensive region being covered by a mixed deposit of clay, sand, gravel, and boulders, called the "Drift," made up of the debris of more northern rock strata, which have been carried, during long periods of polar refrigeration, by the immense glaciers which then covered a great portion of the Northern Hemisphere.

This mixed deposit—made up largely of coarse and hard silicious materials, which so covers the country of the great Northwest that scientific observers of the North have asserted that the soil is not affected by its underlying rock stratum—does not seem to have crossed the Valley of the Ohio river to enter Kentucky. The southern extremity of the polar ice-field seems to have been near the line of our latitude, and the great stream of water flowing from it, carrying its gravel and sand, deflected by the river valley and by the elevated table-land of our ancient rocks, was turned west of our State, leaving undisturbed and unburied the rich soil which had been produced in the long period during which those rocks had been raised above the ocean level.

To these fortunate geological conditions, therefore, are our Kentucky soils greatly indebted for their fertility and for the extremely fine state of division of their constituent particles. In the great majority of these soils analyzed by the present writer, the silicious particles, left after digesting the soils in chlorohydric acid, of specific gravity 1.1, all passed through a fine sieve, which had sixteen hundred meshes in the centimetre square. All scientific writers on soils attach the greatest importance to the relative fineness of the particles which form them. Mons. DeGas-

* See page 9, "Advantages of Kentucky for English Immigrants," issued from the office of the Kentucky Geological Survey.

parin ("*Terres Arables*," *3me. ed., p.* 33) says: "It must not be forgotten that the nutritive power of a soil, other things being equal, is in direct proportion to the fineness of the particles which compose it;" so much so, indeed, that when a soil is to be chemically analyzed, only the "fine earth," or that portion which will pass through a sieve having ten wires to the centimetre, is taken for the analysis, the coarser part being considered practically inert as to plant nourishment—only a skeleton, which is not to be taken into account when estimating the fertility of a soil; and this is especially true when the coarser particles are of quartz, or some hard silicate not readily to be disintegrated or decomposed by the ordinary process of weathering, or which do not contain any essential element of plant nourishment.

In this important particular our Kentucky soils are more valuable than the great body of those of the great Northwest: that not only are their constituent particles very minutely divided, but even these, fine enough to pass through the meshes of the finest sieve above described, are not entirely fine sand of *silica*, but contain a considerable proportion of fine particles of decomposable silicates, which in the process of weathering help to keep up the supply of essential plant food, and make the soils very durable. In some of his analyses of Kentucky soils, the writer has found as much as 2.9 per cent. of potash in the fine silicious residue of a soil which was left after a week's digestion in diluted chlorohydric acid, but which would gradually be unlocked and made available for plant growth under the influence of time and the atmospheric agencies.

The late Dr. David D. Owen, former Director of the Kentucky Geological Survey, placed in the writer's possession a series of samples of soils which he had collected during his celebrated exploration of the great Northwestern Territory for the United States Government in 1847–'50; some of which the writer analyzed, giving the results in Vol. IV, O. S., Kentucky Geological Reports. These soils, characteristic of the best of this great prairie region, are mostly very dark colored, sometimes almost black, from the presence of a large proportion of organic matter, some of which is peaty or semi-bituminous—of little value for plant food—derived from the decomposing remains of many successive growths of grasses or aquatic plants in recent or former ages; but in them all, and in some of them in very large proportion, are visible grains of quartzose sand, reducing materially the quantity of "fine earth," and, consequently, the durability of these soils. While the organic matters, the dark vegetable mould, give to such soils great fertility at first, and cultivation is facilitated by the sandy ingredient, the durability of such soils, without the aid of artificial fertilizers, would be much less than that of our best Kentucky soils, which contain no coarse sand, but are altogether "fine earth," made up partly of decomposable silicates. By reliable accounts the older prairie farmers find it necessary even now to resort to artificial fertilizers, while on the best lands of Kentucky cropping for a hundred years has not yet brought about this necessity, nor will it perhaps for hundreds of years more, where the soil rests on a decomposable limestone which annually gives

up in solution to the soil above as much essential mineral plant food as may be removed from it by a judicious system of culture.

The great wheat-growing region of the Northwest, known as the Red River Valley, is unmodified glacial drift, * and the exhaustion by the present system of culture may be confidently predicted.

Scarcity of Water.

A serious drawback to much of the prairie region of Kansas and the Northwest is the scarcity and inferior quality of the water. Many records to prove this can be had, but I will only give one relative to the Red River Valley.

The following extracts are from the Geological Survey of Minnesota for the year 1877. Of the unwholesomeness of the water it says:

It was found that this difficulty is by no means confined to the Valley of the Red River of the North. It is encountered with equal frequency throughout the entire western half of the State, from the Iowa line northward to Manitoba. . . . .

The flat prairie country generally through the western portion of the State has been much troubled by bad well-water, ... attributed to a so-called "peculiar clay," a "blue clay," a "black clay," or to some other deposit in the drift which had been met with in the wells. Similar reports had come from the country further north, and latterly from the Red River Valley especially. . . . . The waters from the wells dug, whether deep or shallow, have been found to become foul or stagnant sooner or later. . . . . These waters had a very deleterious effect upon the health of the people; . . . . . produced diarrhœa of a persistent nature, and finally typhoid fever. Some cases have terminated fatally. These facts were of occurrence on the line of the St. Paul and Pacific Railroad at nearly all the stations west of the Big Woods, even outside the valley of the Red river; on the Northern Pacific Railroad west of Detroit; along the line of the same railroad in Dakota, and down the valley to Winnipeg. These effects were known also south of the Minnesota river. . . . . The effect of the water is not always an immediate typhoid fever, but an aggravated diarrhœa, and then dysentery, which lead finally to typhoid fever. . . . . Sometimes the fever assumes a local name. At Bismark it is known as "Montana Fever." In Morehead it is known as the "Red River Fever."

The advantages possessed over Kansas and the Northwest are best shown by comparison of the history of the early settlers of the two States. The pioneers of Kentucky came over the mountains before roads were constructed, contended with hostile Indians, were remote from markets of any kind, yet no instance of suffering or want is recorded.

* See Minnesota Geological Report, 1879, page 96.

Imlay, who visited this State soon after the war with England, and wrote very instructive descriptive letters to a friend in London, thus tells the story of their success:*

Such has been the progress of this country (Kentucky) from dirty stations or forts, and smoky huts, that it has expanded into fertile fields, blushing orchards, pleasant gardens, luxuriant sugar groves, neat and commodious houses, rising villages, and trading towns. Ten years have produced a difference in the population and comforts of this country, which to be portrayed in just colors would appear marvelous. To have implicit faith or belief that such things have happened, it is first necessary to be (as I have been) a spectator of such events.

Compare this with the condition of the farmers of Kansas, settling along lines of railway, with easy communication with the world, yet calling every few years for food and clothing, counties issuing bonds and levying a tax upon posterity to keep *farmers* from starving, until the taxation has reached in some counties over $5 on each $100 worth of taxable property.†

The memory of the recent "exodus" of many negroes from the South to Kansas is fresh, and how it was brought about by crack-brained or ignorant "philanthropists," dishonest agents, and persons willing to sacrifice the best interests of the deluded negro for the paltry commissions from the sales of lands and railway tickets. It is a noteworthy fact, that throughout the South there has never been want nor suffering among the negroes in the agricultural districts,‡ notwithstanding they were thrown upon their own resources when set free, without property of any kind, in a country recently devastated by war.

Yet, when the negroes went to Kansas, many of them of the most thrifty, with the accumulated savings of several years, there came from that State tales of suffering, want, and starvation, calling for vigorous measures of relief all over the country.

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* London, printed for J. Debrett, opposite Burlington House, Piccadilly, 1792.

† The average rate of taxes for the entire sixty-nine counties of Kansas was, in 1878, $3.27 as compiled from data furnished the State Board by the Auditor of that State. (See Report Kansas Board of Agriculture for the years 1877–'8, third edition, page 391.) The average rate in Kentucky, city, county, and State combined, is not over 60 cents on the $100 worth of property; and if we exclude a few of the largest cities, it will average, for a large part of the State, less than 60 cents. With this small tax the State has paid off all debts; invested over $6,000,000 in the construction of turnpike roads and improvements of rivers, and gives annually to the public schools $800,000. Many counties also take stock in the building of turnpike roads within their borders, and add to the amount donated by the State for school purposes. All of which is included in the rate above given.

‡ Read in this connection article entitled "A Georgia Plantation," Scribner's Monthly, April, 1881 (Vol. XXI).

Remoteness from Seaboard Markets.

Grain, the principal product of the Northwest, has its value determined by the prices ruling at the great Atlantic ports, and by the cost of transportation thither. The center of population of the United States is located by the census of 1880 at Cincinnati, on the northern border of Kentucky. The Kentucky farmer finds a ready market for all his products nearer home than does the Western farmer. The great distance tax must be paid by the farmers of the West until manufactures have been established in their midst. The scarcity and inferior quality of fuel, the want of timber and iron ores, the scarcity of reliable water-powers, will always place manufactures in that region at a disadvantage; whilst, on the other hand, the unequaled combination of climate, water-power, excellence and abundance of coal, iron ores, clays, and minerals of all kinds along the great Appalachian uplift and their flanks, extending for a hundred miles and more on either side, insure to this region the highest possible development of manufactures. In fact, no other region in the world of like area possesses such a combination of natural resources and adaptability to agricultural development. Nowhere else in America can lands of equal fertility and desirability be had so cheap. Here, in the States of the Virginias, Kentucky, North and South Carolina, Tennessee, Georgia, and Alabama, is an area of over 340,000 square miles, larger than the German Empire and Great Britain and Ireland combined—here are happy homes to be had for millions of industrious people.

I am aware of the great progress of the Northwest in wealth and population, and know that thousands of farmers have succeeded there in establishing themselves in comfort; yet I am confident that the same energy, industry, thrift, and economy, so necessary to success there, will produce better results in Kentucky and the South Atlantic States. Much of the boasted progress of the Northwest is the result of the many miles of railway built by donations of public lands by the General Government, and capital brought from the older States and from Europe. So, also, were the schools and many of the public works. Immense immigration, induced by the most extensive advertising the world has ever known, has poured in upon that section, bringing wealth from abroad. The mania for speculation has drawn immense sums of money to the West, making a constant drain upon the productiveness of the East. Thus the West has been built up—not by the wealth produced from the soil, but by the wealth brought from abroad.

I have briefly put forth some of the advantages possessed by Kentucky on the map accompanying this publication. The peculiar advantages of the region I have mentioned are so graphically portraved by

Mr. Sidney Lanier in an article on the New South* (in which he shows that the New South means small farming, diversified farm products, and the highest possible agricultural development), that I cannot better close this paper than by quotations from that article:

It is impossible to end without adverting to a New South, which exists in a far more literal sense than that of small farming. . . . . .

How much of this gracious land is yet new to all real cultivation? how much of it lies groaning for the muscle of man? and how doubly mournful is this newness in view of the fair and fruitful conditions which here hold perpetual session, and press perpetual invitation upon all men to come and have plenty! Surely, along that ample stretch of generous soil, where the Appalachian raggedness calm themselves into pleasant hills, a man can find such temperances of heaven and earth—enough of struggle with nature to draw out manhood, with enough of bounty to sanction the struggle—that a more exquisite co-adaptation of all blessed circumstances for man's life need not be sought. . . . . The whole prospect seems to yearn for men. Everywhere the huge and gentle slopes kneel and pray for vineyards, for corn-fields, for cottages, for spires to rise up from beyond the oak groves. It is a land where there is never a day, of summer nor of winter, when a man cannot do a full day's work in the open field. All the products meet there, as at nature's own agricultural fair, so that a small farm may often miniature the whole United States in growth; the little valleys everywhere run with living waters, asking grasses, and cattle, and quiet grist-mills; all manner of timbers for economic uses, and trees for finer arts, cover the earth; in short, here is such a neighborly congregation of climates, soils, minerals, and vegetables, that within the compass of many a hundred-acre farm a man may find wherewithal to build his house of stone, of brick, of oak, or of pine, to furnish it in woods that would delight the most curious eye, and to support his family with all the necessaries, most of the comforts, and many of the luxuries of the whole world. **It is the Country of Homes.**

* Scribner's Monthly for October, 1880, Vol. XX, page 840.